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Development and Evaluation of Herbal Floating Tablets Based on Natural Mucilage for Diabetes Management

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Abstract

Objectives: The study aimed to develop and evaluate floating tablets of *Boerhavia diffusa* extract to enhance gastric retention and provide controlled release for effective management of diabetes mellitus. ***Methods:*** Floating tablets were prepared using *Trigonella foenum-graecum* mucilage and HPMC K100M by wet granulation. Pre-formulation studies, FTIR compatibility tests, and phytochemical screening were performed. The tablets were evaluated for pre- and post-compression parameters, *in-vitro* buoyancy, swelling index, dissolution, kinetic modeling, and stability studies as per ICH guidelines. ***Results:*** All formulations showed acceptable micromeritic properties and mechanical strength. The swelling index increased progressively up to 8 h, with formulation F5 exhibiting the highest swelling capacity. *In-vitro* buoyancy tests confirmed floating lag times of less than 1 min and sustained flotation for more than 10 h. Dissolution studies demonstrated drug release in the range of 70.61–89.56% over 12 h, with F5 showing the most controlled release profile. Kinetic modeling indicated zero-order release with non-Fickian diffusion. Stability testing over three months confirmed no significant changes in hardness, drug content, or release characteristics. ***Conclusion:*** The optimized formulation (F5) demonstrated desirable swelling, buoyancy, and sustained release properties, establishing *Boerhavia diffusa* floating tablets as a promising gastro-retentive delivery system with potential therapeutic benefits in diabetes management.

Keywords: *Boerhavia diffusa*, floating tablets, gastro-retentive drug delivery, controlled release, diabetes mellitus.

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INTRODUCTION

The oral route remains the most promising and convenient method for drug administration, offering several therapeutic advantages such as eases of dosing, patient compliance, and formulation flexibility [1]. However, the major challenge in developing oral delivery systems is maintaining the dosage form in the stomach or upper gastrointestinal tract (GIT) until complete drug release and absorption occur. To address this limitation, several gastro retentive drug delivery systems (GRDDS) have been developed. GRDDS can prolong gastric residence time, enhance drug bioavailability, improve solubility, and provide controlled and continuous drug release, thereby reducing dosing frequency and improving patient adherence [2]. Among these approaches, floating drug delivery systems (FDDS) are widely studied. These low-density dosage forms remain buoyant in gastric fluids for extended periods, leading to improved bioavailability, reduced side effects, and better therapeutic outcomes. By minimizing dosing frequency, FDDS also improve patient adherence to long-term therapies [3].

Herbal medicines have played a vital role in traditional healthcare systems and continue to provide valuable insights for the development of novel formulations for chronic diseases [4-5]. Diabetes mellitus, a metabolic disorder characterized by impaired insulin function and elevated blood glucose levels,

remains a global health concern [6]. Although numerous synthetic hypoglycemic agents are available, their cost and adverse effects often limit their widespread use. In contrast, plant-derived medicines are safer, less toxic, more affordable, and contain bioactive constituents capable of stimulating insulin secretion, regenerating pancreatic β-cells, and improving insulin sensitivity [7-8].

Boerhavia diffusa (Family: Nyctaginaceae), a renowned medicinal plant in Ayurveda, exhibits diverse pharmacological properties, including antibacterial, hepatoprotective, hypoglycemic, anti-inflammatory, and anti-stress effects [9]. Its potential antidiabetic activity makes it a suitable candidate for herbal formulations. Similarly, *Trigonella foenum-graecum* L. (Fenugreek; Family: Leguminosae) is traditionally recognized for its antidiabetic and lipid-lowering properties. Fenugreek seeds are rich in soluble fibers and mucilage that slow glucose absorption, promote digestion, and reduce blood sugar levels.

In recent years, natural mucilages have gained significant attention over synthetic and semi-synthetic polymers as pharmaceutical excipients. They are inexpensive, biocompatible, non-toxic, and eco-friendly, making them highly valuable in dosage form design. Mucilages also act as natural binders and floating agents, supporting controlled drug delivery and prolonged gastric retention [10]. The present research aims to develop gastro-retentive floating tablets of *Boerhavia diffusa* extract using natural mucilage as a polymeric binder and floating agent. The study explores different ratios of mucilage to optimize tablet properties, evaluate binder effects, and characterize matrix tablets for sustained antidiabetic efficacy. Furthermore, the work investigates the synergistic potential of combining *Boerhavia diffusa* with *Trigonella foenum-graecum* to enhance therapeutic outcomes.

This herbal-based gastro-retentive system is designed to overcome limitations of conventional oral antidiabetic therapies by improving gastric retention, prolonging drug release, and enhancing bioavailability. Ultimately, the study intends to provide an effective, affordable, and patient-friendly formulation for the management of diabetes mellitus, while promoting the integration of traditional herbal medicines with modern drug delivery technologies.

MATERIALS AND METHODS

Materials

HPMC K100M, Sodium Bicarbonate, and Magnesium Stearate were obtained as gift samples from Qualikems Fine Chem. Pvt Ltd, New Delhi. Talc was procured from Hi-tech Chemicals, India. Acetic acid was obtained from Chemdyes Corporation, Rajkot, and Ethanol from Research Lab Fine Chem Industries, Mumbai. All other chemicals and solvents used were of analytical grade.

Methods

Preparation of Herbal Extract

Boerhavia diffusa leaves were collected, authenticated (Specimen No: 014, Farook College, Kozhikode), shade-dried, chopped, and extracted with distilled water using a Soxhlet apparatus. The extract was concentrated by evaporation to obtain a dark greenish-black powder for further use [11].

Isolation of Mucilage

Trigonella foenum-graecum seeds were collected, authenticated (Specimen No: 013, Farook College, Kozhikode), ground, and sieved. The powder was soaked overnight in distilled water, and the swollen mucilage was filtered through muslin cloth, precipitated with ethanol, dried, and powdered [12].

Phytochemical Screening Test for extract and mucilage

The extract and mucilage were subjected to preliminary phytochemical screening using standard procedures [13].

- *Alkaloids*: Dragendorff's, Mayer's, and Hager's tests gave characteristic precipitates, confirming the presence of alkaloids.
- *Carbohydrates:* Molisch's, Fehling's, and Benedict's tests indicated the presence of reducing sugars.
- *Tannins:* Ferric chloride, lead acetate, and iodine tests confirmed tannins.
- *Flavonoids*: Shinoda, lead acetate, and sodium hydroxide tests produced characteristic colour reactions.
- *Proteins*: Millon's and Biuret tests confirmed proteins.
- *Mucilage*: Ruthenium red test showed positive reaction.

Characterization of Isolated Mucilage

The isolated mucilage was evaluated for the following parameters [14-15]:

- *Organoleptic properties*: Colour, odour, taste, and texture were recorded.
- *Solubility*: Determined in acetone, ethanol, and water by shaking the powdered mucilage.
- *Swelling index*: Measured by dispersing 1 g of mucilage in 25 ml of water, with periodic shaking for 1 h and standing for 3 h; the mean swelling index was calculated.
- *pH*: Determined for a 1% w/v aqueous solution using a digital pH meter.
- *Micromeritic properties*: Bulk density, tapped density, Carr's index, Hausner's ratio, and angle of repose were calculated.

Estimation of *Boerhavia diffusa* Extract

Determination of UV Absorption Maxima (λ max)

Accurately weighed extract (100 mg) was dissolved in 100 ml of 0.1 N HCl (pH 1.2) to obtain a stock solution (1000 µg/ml). From this, serial dilutions

(1–10 µg/ml) were prepared and scanned in the range of 200–780 nm using a UV spectrophotometer to determine the absorption maxima [16].

Construction of Calibration Curve

A 100 mg extract sample was dissolved in 100 ml of 0.1 N HCl to obtain a primary stock solution, and further diluted to prepare a secondary stock (10 µg/ml). Aliquots ml of the secondary stock were diluted to 10 ml with 0.1 N HCl to yield concentrations of 2–12 µg/ml. Absorbance values were recorded and a calibration curve was constructed by plotting concentration (X-axis) against absorbance (Y-axis). Linearity was assessed from the correlation coefficient (R^2) [17].

Pre formulation and Compatibility Studies

Pre-formulation is a critical step in dosage form development, providing essential information on the physicochemical properties of drug substances and their interactions with excipients. In this study, pre-formulation was performed on the extract and its physical admixtures for spectral identification and compatibility evaluation. Drug–polymer interactions were assessed using Fourier Transform Infrared (FTIR) spectroscopy. The extract alone and in combination with selected polymers was analyzed to confirm compatibility [18].

Formulation of Floating Tablets

Floating tablets containing *Boerhavia diffusa* extract were prepared by the wet granulation method using varying concentrations of *Trigonella foenum-graecum* mucilage. All ingredients were passed through a #60 mesh sieve and blended uniformly in a mortar, except magnesium stearate and talc. Granulation was performed using isopropyl alcohol as the binding agent, and the wet mass was passed through a #10 mesh sieve to obtain granules. The granules were dried in a hot air oven at 50 °C for 30 minutes, mixed with magnesium stearate (lubricant) and talc (glidant), and compressed into tablets using an eight-station rotary tablet press. The prepared batches (Table-1) were collected and stored in airtight containers for further evaluation [19-20].

Pre-Compression Parameters of Powder Blend

The flow properties (Micromeritic) of the powder blend were evaluated using standard pre-compression parameters [21].

- *Bulk Density:* Determined by measuring the mass of the powder and its bulk volume in a 100 mL graduated cylinder.
- *Tapped Density:* Measured after tapping a 10 mL cylinder containing the powder until a constant volume was obtained.
- *Carr's Index:* Calculated from bulk and tapped densities to assess compressibility.
- *Angle of Repose:* Evaluated using the fixed funnel method, with the angle computed from the heap height and radius.

Post-Compression Parameters of Floating Tablets

- *Thickness:* Determined using a Vernier caliper to ensure uniformity, which is critical for counting and packaging [19].
- *Hardness:* Measured using a Pfizer hardness tester, indicating resistance to chipping, abrasion, or breakage during handling and storage [14].
- *Weight Variation*: Twenty tablets were individually and collectively weighed on a digital balance. The average weight was calculated, and deviations were assessed as per pharmacopeial limits [22].
- *Friability*: Twenty tablets were tested in a Roche friabilator at 25 rpm for 4 min (100 revolutions). A weight loss of <1% was considered acceptable [19].
- *Drug Content:* Powder equivalent to one tablet was dissolved in 0.1N HCl, diluted, sonicated, and analyzed at 441 nm using a UV-Visible spectrophotometer [20].
- *Swelling Index:* Three tablets were immersed in 50 mL of 0.1N HCl. At predetermined intervals, tablets were blotted, reweighed, and swelling percentage was calculated [20, 23].

***In-vitro* Buoyancy Study**

The buoyancy of tablets was evaluated by measuring floating lag time (FLT) and total floating time (TFT). Tablets were placed in 100 mL of 0.1N HCl, and the time taken to float on the surface was recorded as FLT, while the duration of sustained floating was recorded as TFT [20, 24].

***In-vitro* Drug Release Studies and Kinetic Analysis**

Dissolution testing was performed using USP apparatus II (paddle method) with 900 mL of 0.1N HCl (pH 1.2) at 37 ± 0.5°C and 50 rpm for 12 h. At predetermined intervals, 5 mL samples were withdrawn, filtered, and replaced with fresh medium. Samples were diluted as required and analyzed spectrophotometrically at 441 nm [20]. *In-vitro* release data were fitted to various kinetic models, including Zero-order (cumulative % drug release vs. time), First-order (log cumulative % drug remaining vs. time), Higuchi (cumulative % drug release vs. square root of time), and Korsmeyer–Peppas (log cumulative % drug release vs. log time) to determine the release mechanism.

Stability Studies

Stability studies were conducted as per ICH guidelines. The optimized formulation was stored in polyethylene bottles at 40°C in a stability chamber. At scheduled intervals, tablets were evaluated for hardness, drug content, and *in-vitro* release profile [25].

RESULTS

Floating tablets of *Boerhavia diffusa* extract were developed to enhance gastric retention and prolong residence time, aiming to reduce diabetic complications.

The formulations, prepared using *Trigonella foenum-graecum* mucilage and HPMC K100M, were evaluated for weight variation, friability, thickness, hardness, buoyancy, swelling, dissolution, and stability.

Phytochemical Screening Test

Phytochemical evaluation of extract and mucilage (Table-2) revealed the presence of carbohydrates, proteins, tannins, flavonoids, and alkaloids in *B. diffusa*, while *T. foenum-graecum* mucilage contained only carbohydrates and proteins.

Characterizations of Isolated Mucilage

The isolated mucilage from *Trigonella foenum-graecum* exhibited light yellow colour, characteristic odour, bitter taste, and rough texture, consistent with natural plant-derived polysaccharides. Its insolubility in organic solvents and swelling behaviour in water confirm its hydrophilic nature, making it suitable for sustained drug release applications. The micromeritic properties of the mucilage were found to be within acceptable pharmaceutical limits. The bulk density and tapped density were 0.666 ± 0.06 g/ml and 0.769 ± 0.03 g/ml, respectively. The Carr's index (9.78 ± 0.12%) and Hausner's ratio (1.13 ± 0.03) indicated good flow characteristics. The angle of repose (26.85 ± 0.24°) also confirmed excellent flowability, as values between 25–30° are generally associated with good powder flow. The swelling index of the mucilage was found to be 62.32%, indicating good swelling efficiency and its potential to retard drug release in controlled-release formulations. The pH of the mucilage was 6.70, which is nearly neutral and considered non-irritant to the gastric mucosa. The particle size was 114.6 µm, suggesting suitability for tablet formulation. All characterizations results are found in Table-3.

Determination of UV Absorption Maxima

The absorption maximum (λ max) of the extract (Figure-1) was identified at 441 nm using UV spectroscopy (200–780 nm range) in pH 1.2.

Construction of Calibration Curve

The calibration curve of the extract (Figure-2) was determined using pH 1.2 buffer. A linear relationship was obtained by plotting concentration on the x-axis and absorbance on the y-axis (Fig. 2), with an R^2 value of 0.9972, indicating compliance with Beer–Lambert's law.

Pre formulation and Compatibility Studies

Compatibility studies of the extract (medicament) and its physical admixtures were carried out using the FT-IR method. FT-IR spectra were recorded in the wavelength range of 500–4500 cm^{-1} at ambient temperature with a resolution of 2 cm^{-1}. The positions and relative intensities of absorption bands of the admixtures were compared with those of *Boerhavia diffusa* extract. The IR spectra of extract, mucilage and their physical admixtures are presented in Figure - 3 to 6. FT-IR analysis was performed to assess the compatibility of *Boerhavia diffusa* extract with natural and synthetic polymers. The spectra of the pure extract showed characteristic peaks at 3412 cm^{-1} (N–H stretching), 2862 cm^{-1} (C–H stretching), 2654 cm^{-1} (O–H stretching), 1668 cm^{-1} (C=C bending), 1317 cm^{-1} (C–O stretching), and 850 cm^{-1} (C–Cl bending), confirming the presence of functional groups consistent with its phytochemical profile.

Similarly, spectra of *Trigonella foenum-graecum* mucilage, HPMC K100M, sodium bicarbonate, magnesium stearate, and talc exhibited their characteristic absorption bands, aligning with reported functional group assignments. The spectra of physical admixtures (extract with mucilage, HPMC K100M, and their combination) retained the major characteristic peaks of the extract and polymers without significant shifts or disappearance of bands. The absence of new peaks or marked changes in intensity indicates no significant chemical interaction between the drug and excipients. Thus, FT-IR studies confirmed the compatibility of *Boerhavia diffusa* extract with the selected polymers and excipients, supporting their use in the formulation of floating tablets.

Pre-compression Parameters

Micromeritic Properties

The pre-compression parameters of the powder blend (extract), including bulk density, tapped density, Carr's index, Hausner's ratio, and angle of repose, were evaluated, and the results are presented in Table-4. The bulk density of the powder blend ranged from 0.421 ± 0.021 to 0.455 ± 0.025 g/ml, while the tapped density ranged from 0.442 ± 0.012 to 0.491 ± 0.036 g/ml. These values yielded a Carr's index in the range of 4.25 ± 0.027 to 6.80 ± 0.019%, indicating acceptable compressibility. The Hausner's ratio values were found between 1.010 and 1.091, confirming the blend exhibited satisfactory flow properties. The angle of repose ranged from 23.54 ± 0.34° to 24.87 ± 0.40°, further supporting the conclusion that the powder blend possessed good flow characteristics.

Formulation of Tablets

Floating tablets containing *Boerhavia diffusa* extract were prepared using different ratios of HPMC and *Trigonella foenum-graecum* mucilage by the wet granulation method, and the images of the prepared tablets are shown in Photograph-1.

Post-compression Parameters

The thickness of the floating tablets ranged from 5.02±0.34 to 5.09±0.21 mm, while hardness values were between 4.47±0.11 and 4.75±0.01 kg/cm^2, indicating satisfactory mechanical strength. Weight variation was found within 0.43±0.02 to 0.51±0.06%, which complied with the pharmacopeial limit of less than 5%. Friability values ranged from 0.60±0.01 to 0.70±0.07%, confirming that all formulations were

mechanically stable (pharmacopeial limit <1%). The percentage drug content was observed between 85.01±0.56 and 98.58±0.24%, with formulation F5 exhibiting the highest drug content (Table-5).

Swelling Index

The swelling index of the floating tablets was evaluated in 0.1N HCl for up to 8 hours, and the results are illustrated in Figure-7**.** All formulations (F1–F5) exhibited a progressive increase in swelling index over time, with values ranging from 65.86% to 78.15% at the end of 8 hours. The swelling behavior followed the order F5 > F3 > F1 > F4 > F2**.** Among the formulations, F5 demonstrated the highest swelling index, indicating superior water uptake capacity. This increase in swelling index with time can be attributed to the hydrophilic nature of the polymers, which gradually absorb water and expand**.**

***In-vitro* Buoyancy Study**

The studies were carried out by placing each formulated tablet in a 100 mL beaker containing 0.1N HCl (pH 1.2), and both the floating lag time (FLT) and total floating duration were recorded. All formulations exhibited a floating lag time of less than 1 minute, ranging from 0.38±0.06 to 0.51±0.04 seconds**,** indicating rapid buoyancy. The total floating time was found to be greater than 10 hours for all batches. Sodium bicarbonate, used as an effervescent agent, effectively generated carbon dioxide, which was entrapped in the hydrated polymer matrix, thereby ensuring tablet buoyancy. Among all formulations, F5 demonstrated superior floating ability**,** which can be attributed to the higher concentration of polymers employed. The floating behavior of optimized F5 tablets in the medium at different time intervals is shown in Photograph-2**.**

***In-vitro* Drug Release Studies and Kinetic Analysis**

Drug Release Studies of *Boerhavia diffusa* floating tablets were performed in 0.1N HCl for 12 hours and the release profiles are shown in Figure-8. All formulations (F1–F5) exhibited drug release ranging from 70.61±0.11% to 96.25± 0.43%. Among them, F5 showed sustained release (73.02±0.10%) over 12 hours, attributed to the synergistic effect of fenugreek mucilage and HPMC at optimized concentrations, which effectively retarded release. In contrast, formulations prepared with HPMC alone (F3 & F4) released 87.43±0.53% and 94.36±0.04%, while those containing only fenugreek mucilage (F1 & F2) showed higher release of 90.45±0.21% and 96.25±0.43%, respectively. These results confirm the superior controlled-release behavior of the F5 formulation.

From the *in-vitro* drug release studies, the correlation coefficient (R^2) values for all formulations (F1–F5) ranged between 0.9763 and 0.9860, indicating that the release profiles followed zero-order kinetics, suggesting a concentration-independent release pattern. When fitted to Higuchi's model, the correlation values (0.9814 to 0.9967) demonstrated that the release process was predominantly diffusion-controlled. Further evaluation using the Korsmeyer–Peppas model revealed that the release exponent (*n*) values ranged from 0.5107 to 0.6335, indicating a non-Fickian (anomalous) diffusion mechanism, where drug release occurs through a combination of diffusion and polymer relaxation (swelling/erosion). Overall, these findings confirm that the floating tablets formulated with HPMC and mucilage provided a controlled drug release over a prolonged period, making the formulation suitable for extended gastric retention and improved therapeutic efficacy.

Stability Studies

The optimized formulation (F5), selected based on *in-vitro* drug release performance, was subjected to stability testing under ICH guidelines. The results for hardness, drug content, and *in-vitro* drug release are presented in Table-6. At the end of third months, the formulation retained a hardness of 3.27±0.16 kg/cm², drug content of 97.52±0.02%, and cumulative drug release of 74.86±0.14% after 12 h. No changes in color or significant deviations in the evaluated parameters were observed throughout the study. These findings confirm that the floating tablets containing extract remained physically stable and pharmacologically effective, demonstrating their potential suitability for long-term use in the management of diabetes mellitus.

Table 1: Composition of Floating Tablet Formulations

Ingredients	**F1**	**F2**	**F3**	**F4**	**F5**
Boerhavia diffusa extract	250	250	250	250	250
Fenugreek mucilage (powder)	85	80	–	–	40
HPMC K100M	–	–	85	80	40
Sodium bicarbonate	50	55	50	55	55
Magnesium stearate	5	5	5	5	5
Talc	10	10	10	10	10
Total weight (mg)	**400**	**400**	**400**	**400**	**400**

Table 2: Phytochemical Screening of Extract and Mucilage

Phytochemical Compound	Results	
	***Boerhavia diffusa* Extract**	***Trigonella foenum-graecum* Mucilage**
Carbohydrate	Present	Present
Alkaloid	Present	Absent
Flavonoid	Present	Absent
Tannins	Present	Absent
Protein	Present	Present

Table 3: Physicochemical Characterization of Mucilage

Parameters	Results
Organoleptic Properties	
Colour	Light yellow
Odour	Characteristic
Taste	Bitter
Texture	Rough
Solubility in Solvents	
Acetone	Insoluble
Chloroform	Insoluble
Ethanol	Insoluble
Water	Swells
Micromeritic Properties	
Bulk density (g/ml)	0.666 ± 0.06
Tapped density (g/ml)	0.769 ± 0.03
Carr's index (%)	9.78 ± 0.12
Hausner's ratio	1.13 ± 0.03
Angle of repose (°)	26.85 ± 0.24
Other Properties	
Swelling index (%)	62.32
pH (1% w/v solution)	6.70
Particle size (µm)	114.6

Table 4: Pre-compression parameters of Powder Blend (Extract)

Formulation Code	Bulk Density (g/ml)	Tapped Density (g/ml)	Carr's Index (%)	Hausner's Ratio	Angle of Repose (°)
F1	0.450 ± 0.021	0.471 ± 0.031	4.25 ± 0.027	1.010	23.54 ± 0.34
F2	0.431 ± 0.017	0.463 ± 0.020	6.52 ± 0.010	1.031	24.61 ± 0.23
F3	0.424 ± 0.071	0.456 ± 0.012	4.60 ± 0.036	1.075	23.81 ± 0.32
F4	0.455 ± 0.025	0.491 ± 0.036	6.80 ± 0.019	1.082	24.32 ± 0.34
F5	0.421 ± 0.021	0.442 ± 0.012	4.32 ± 0.006	1.091	24.87 ± 0.40

Results are Mean ± S.D (n=3)

Table 5: Post-compression Parameters of Floating Tablets

Formulations Code	Thickness (mm)	Hardness (kg/cm^2)	Weight variation (%)	Friability (%)	Drug Content (%)
F1	5.05 ± 0.01	4.53 ± 0.02	0.47 ± 0.02	0.64±0.04	90.15±0.11
F2	5.09 ± 0.21	4.47 ± 0.11	0.51 ± 0.06	0.70±0.07	85.01±0.56
F3	5.03 ± 0.25	4.56 ± 0.03	0.45 ± 0.01	0.60±0.01	93.50±0.21
F4	5.07 ± 0.30	4.50 ± 0.08	0.49 ± 0.03	0.66±0.05	87.47±0.32
F5	5.02 ± 0.34	4.75 ± 0.01	0.43 ± 0.02	0.66±0.05	98.58±0.24

Results are Mean ± S.D (n=3)

Table 6: Stability Studies of Floating Tablet (F5)

At End of Month	Hardness (Kg/cm^2)	Drug Content (%)	Drug Release (%)
1st	4.73±0.03	98.49±0.12	73.93±0.11
2nd	3.95±0.12	97.85±0.04	74.27±0.05
3rd	3.27±0.16	97.52±0.02	74.86±0.14

Results are Mean ± S.D (n=3)

Figure 1: UV Spectrum of *Boerhavia diffusa* Extract

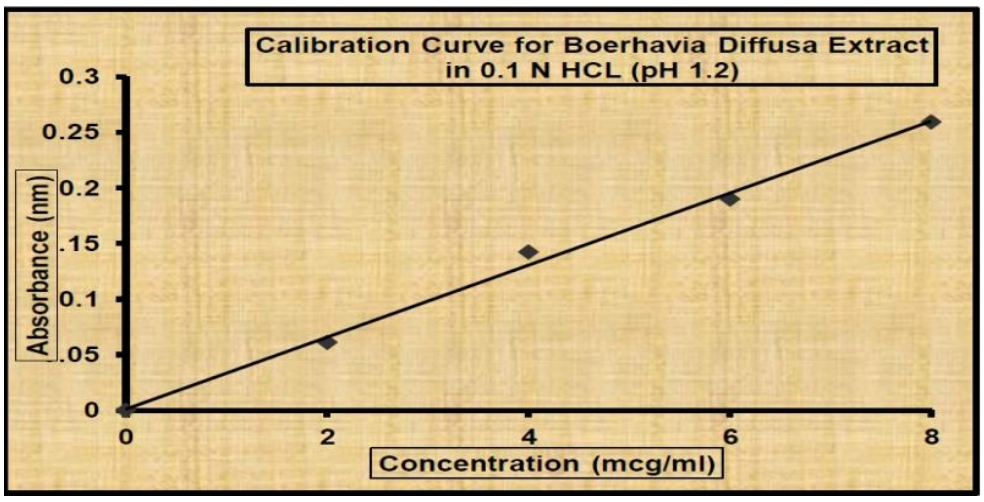


Figure 2: Calibration Curve for *Boerhavia diffusa* Extract

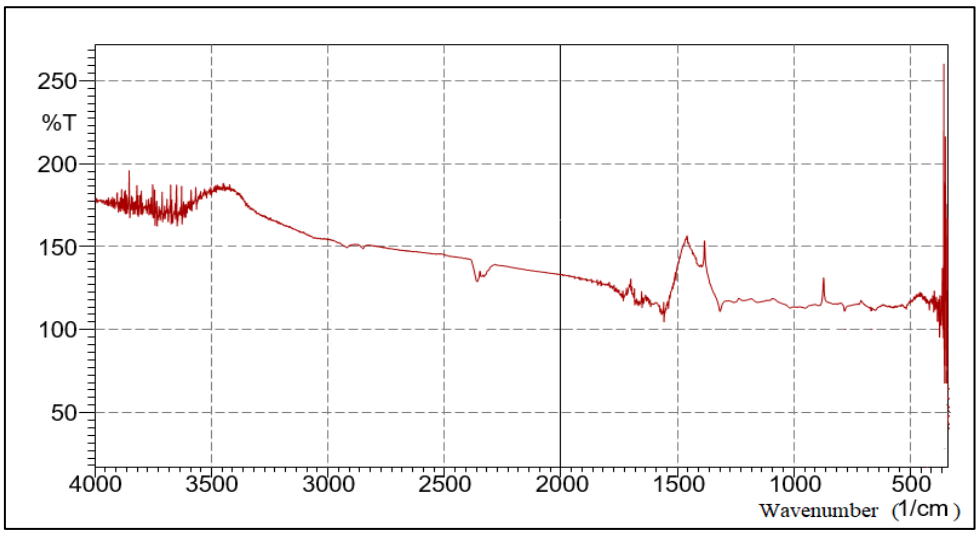


Figure 3: IR Spectra of *Boerhavia diffusa* Extract

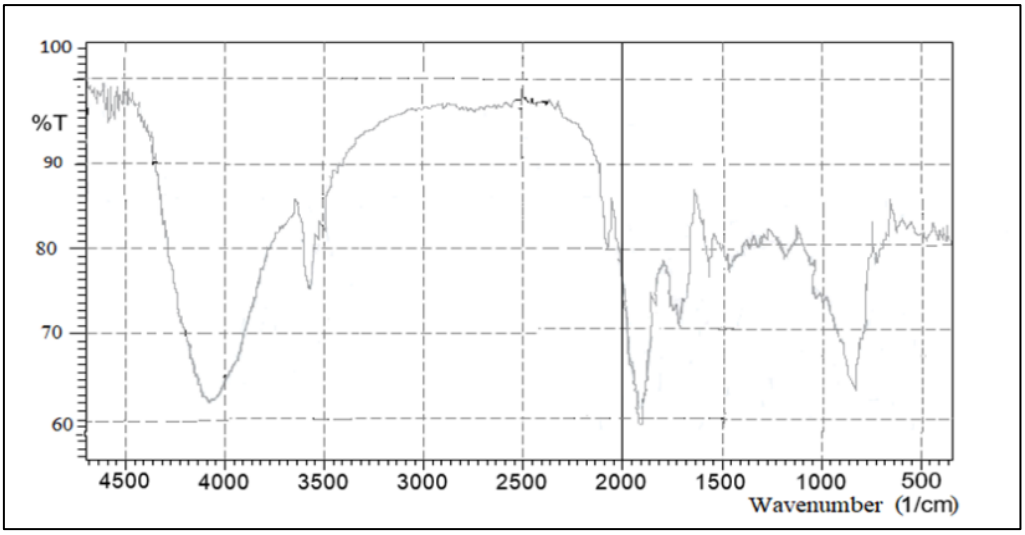


Figure 4: IR Spectra of *Trigonella foenum-graecum* Mucilage

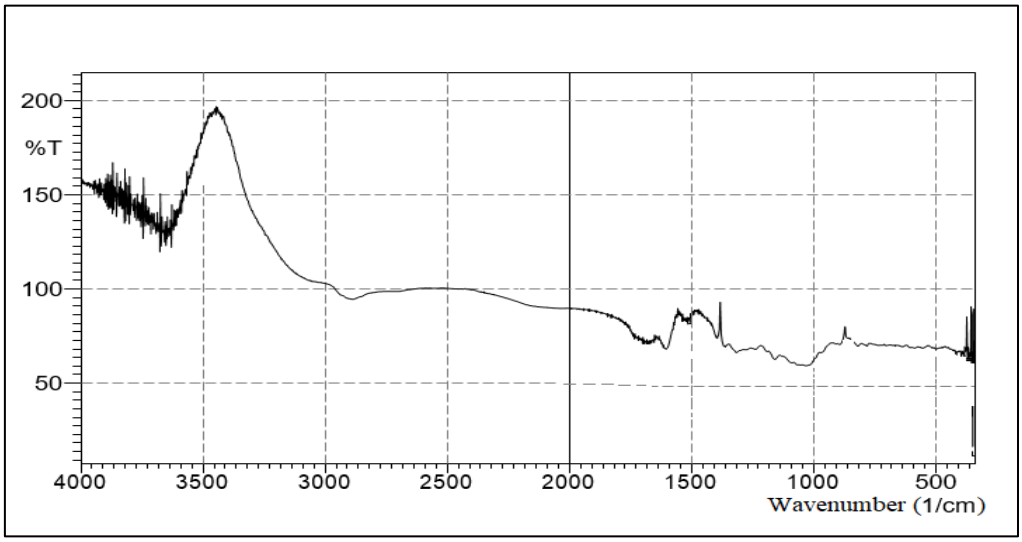


Figure 5: IR Spectra of Extract, Mucilage and Physical Admixtures

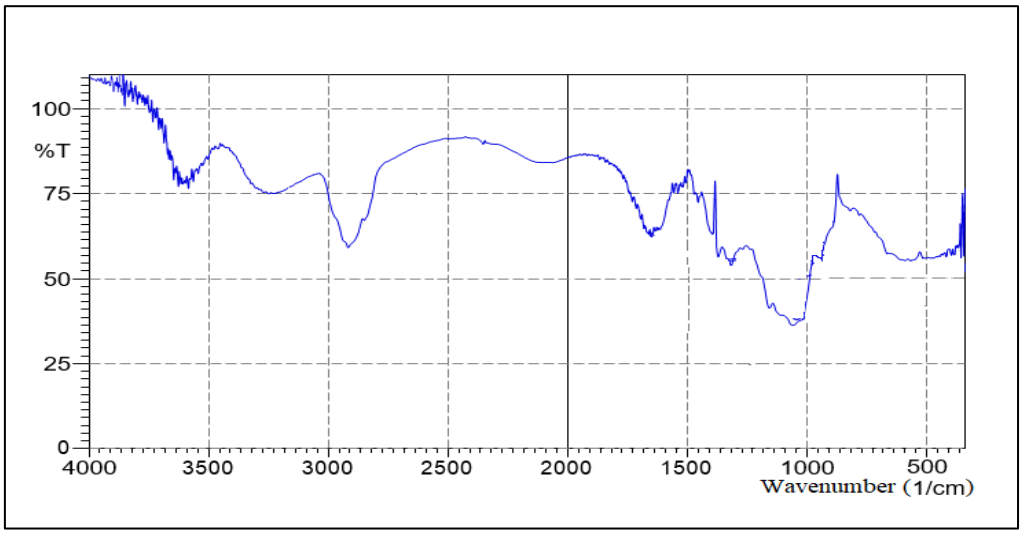


Figure 6: IR Spectra of Extract, Mucilage, HPMC K100 and Physical Admixtures

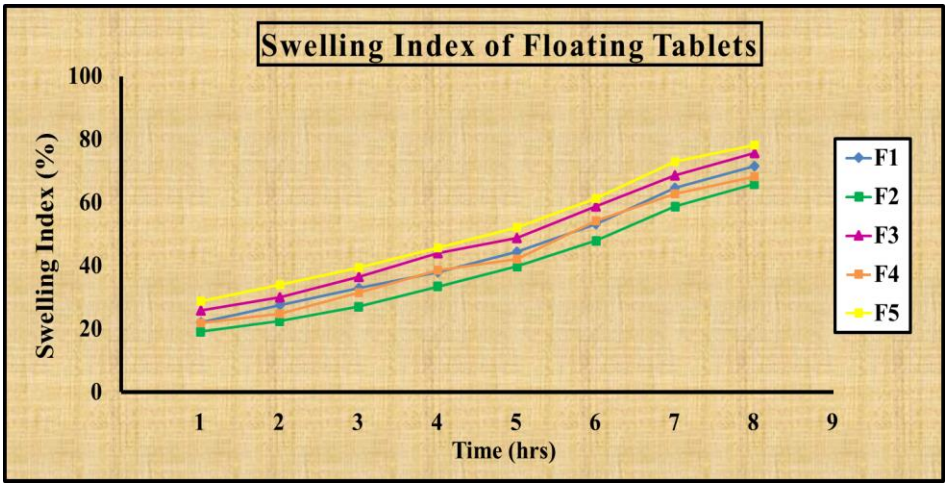


Figure 7: Swelling Index of Floating Tablets

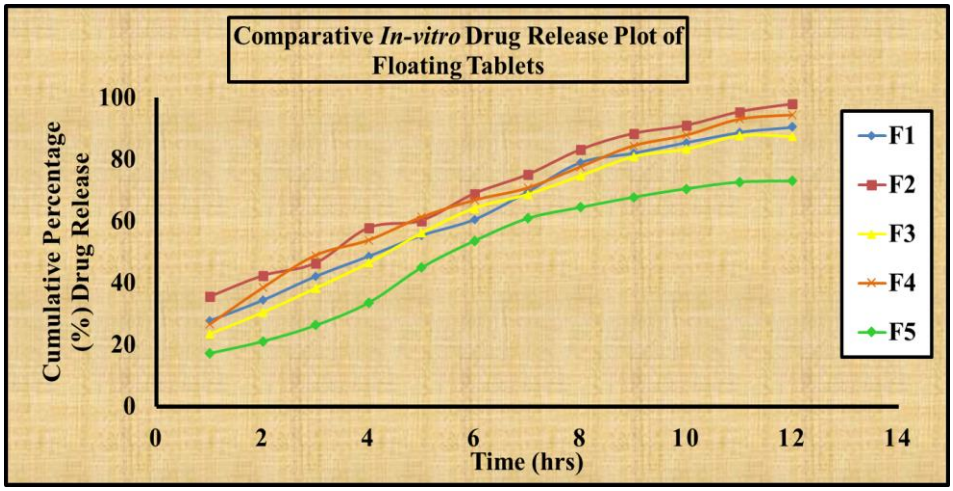
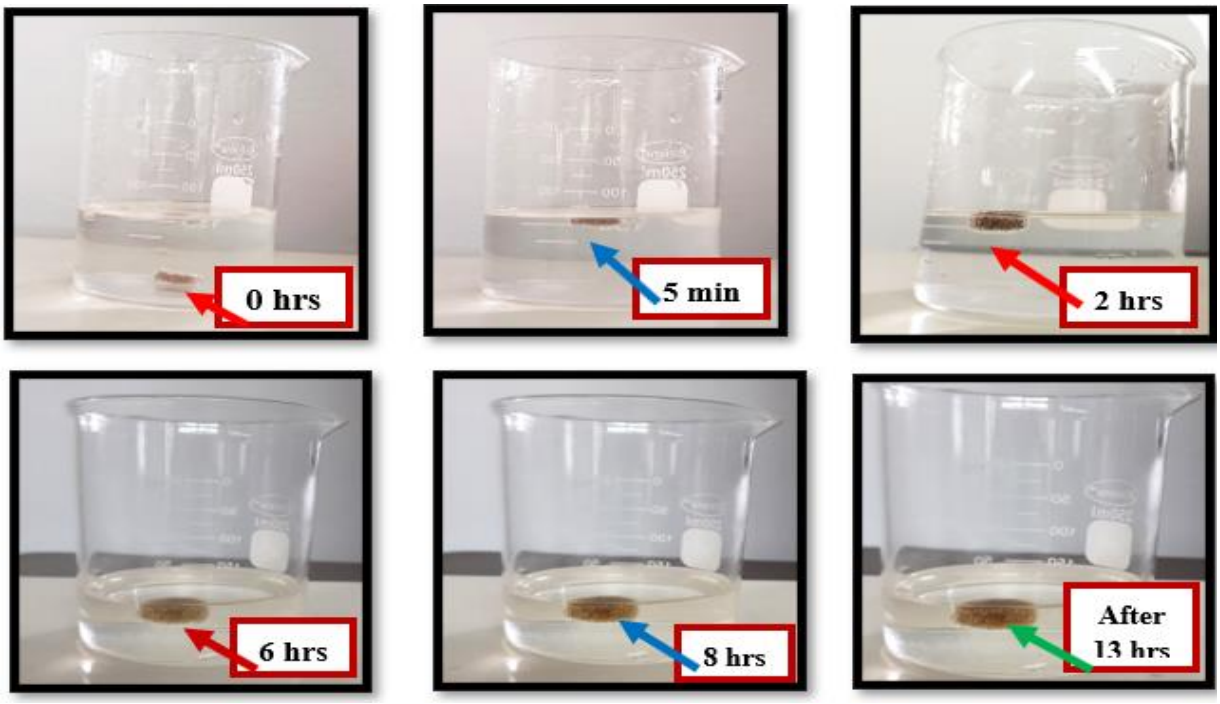


Figure 8: Comparative *In-vitro* Drug Release Plot of Floating Tablets (F1-F5)

Photograph 1: **Floating Tablets of *Boerhavia diffusa* Extract**



Photograph 2: **Floating Behaviour of optimized F5 tablets**

CONCLUSION

Floating tablets of *Boerhavia diffusa* extract were formulated using *Trigonella foenum-graecum* mucilage and HPMC K100M by wet granulation. The optimized batch (F5) exhibited uniform physicochemical properties, short floating lag time, sustained buoyancy, and controlled drug release for up to 12 hours. Drug release kinetics followed zero-order with a non-Fickian diffusion mechanism. Stability testing confirmed retention of hardness, drug content, and release profile without significant changes. These findings suggest that the developed formulation offers a stable gastro-retentive system with potential in diabetes management.

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